The rising costs and regulatory burdens associated with new water supply infrastructure are making it increasingly difficult to meet growing water demands through the development of new supply capacity. Instead, adaptive techniques such as temporary conservation and water transfers are playing a larger role in the water supply planning. While adaptive techniques have many advantages over infrastructure-centric approaches, they also present municipal water utilities with a number of challenges. Adaptive techniques like conservation and the purchase of water transfers introduce substantial and unpredictable reductions in revenue (conservation) and cost increases (transfers). In addition, long-term infrastructure sequencing needs to account for a dynamic response to drought, the effects of which have been historically overlooked by traditional methods. First, we develop portfolios of water supply options for a group of water utilities in the Research Triangle of North Carolina to demonstrate the usefulness of adaptive measures for drought management. We then apply novel financial tools that work in concert with these portfolios, mitigating the subsequent financial risk. Second, we evaluate the tradeoffs between water utilities and their consumers when water shortages are addressed through pricing incentives. Lastly, we introduce a risk-based framework for integrating infrastructure development with adaptive drought management strategies. The methods and insights used here have the potential to be broadly applicable to the water resources management and planning issues faced by a rapidly urbanizing world with a burgeoning understanding of the growing interdependencies between human and natural systems.

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